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Abstract

Small firms are often seen to be the engines of growth. There are two main sources of empirical evidence that are adduced to support this conclusion. The first is that job creation has been coming mainly from small firms. The second is that the share of employment accounted for by small firms has increased in the past two decades. Both of these sources rely on a simple metric--employment. This paper asks whether changes in this metric affect the view of the role that small firms play in the growth process.

The first section of the paper maintains employment as the measure that is used to evaluate the importance of small firms but modifies the raw measure of employment to correct for the fact that small firms pay lower wages than large firms. The paper examines the evidence indicating that smaller producers in the manufacturing sector pay lower wages and that this differential has grown over time. It then uses relative wage rates to create a measure of employment that is adjusted for wage differentials. When this is done, small producers no longer outperform large producers in terms of job creation over the 1970s and 1980s in the Canadian manufacturing sector.

The second section of the paper changes the metric used to evaluate relative performance by moving from employment to output and labour productivity. The paper demonstrates that while small producers have increased their employment share dramatically, they have barely changed their output share. Small firms have been falling behind large firms both with respect to wages paid and labour productivity. Large producers have been decreasing their relative employment while maintaining their relative output share, thereby making dramatic strides in increasing their relative labour productivity.

Keywords: Small business growth, productivity, relative wage rates. JEL: D2, L11

Introduction

The difference between small and large producers in the intensity of job-creation is at the heart of the debate over the necessity of directing industrial policy toward the small-firm sector. To some, this means devising special policies that will help to overcome barriers that impose disadvantages on small producers—such as special financing strategies. To others, it means lobbying governments to ensure that payroll taxes are not biased against small producers.

The job-creation process has been the focus of most of the debate over the importance of small firms. Small firms, it has been claimed, have been creating more new jobs than large firms and have, therefore, been the engines of growth.

Several caveats have been raised about the meaning that should be attached to the job-creation evidence. For a long time, the accuracy of the data bases that were being used to measure job-change in the United States was questioned.[1] More recently, Davis, Haltiwanger and Schuh (1993) have argued that many of the studies have a statistical problem of failing to correct for regression-to-the-mean and that this problem biases most analyses of job growth in favour of small firms.

Others have raised more serious questions about the quality of the jobs that are created by small firms. Brown, Hamilton and Medoff (1990) have noted that wages are generally less in small firms than large firms and that the jobs being created in small and large firms are, therefore, not comparable. Essentially, this debate is about the appropriate metric that should be used to investigate the relative importance of small as opposed to large firms.

Previous Canadian work on the manufacturing sector has carefully examined the extent to which measurement technique that corrects for regression-to-the-mean affects the conclusion that small producers create more jobs than large producers (Baldwin and Picot, 1995).[2] In the previous study, the job generating capacity of small and large producers was compared. Job generation was studied by calculating the job growth in plants and producers where employment was growing; job loss was investigated by calculating job loss in those that were losing employment. Rates of job growth, rates of job decline and net rates of change (the difference between job growth and decline) were calculated by dividing job change by size of producer. Then differences in the rates of job growth and job loss were compared by size class to investigate the extent to which the size classes differed. Careful attention was paid to alternative methods of measuring rates of job change so as to avoid the regression-to-the-mean problem. This previous study examined change both in the short and the longer run and used several different methods to correct for possible regression-to-the-mean in plant size.

Gross *rates* of job gain and job loss were found to be higher in smaller producers[3] (though the actual number of jobs gained and lost per producer was much greater in

the larger plants). However, the net rate of change is generally larger in smaller producers. Indeed, it is positive in smaller producers and negative in larger producers, thereby suggesting that most net job change is contributed by smaller producers.

This paper turns to address the other main theme that can be found in the debate over the contribution of small producers to job growth—that is, the metric that should be used to measure the importance of small producers.

Previous research treats all jobs that are created as equal, even if the jobs receive different rates of remuneration. This paper asks whether the small-producer contribution to employment growth changes when corrections are made for the fact that small producers generally pay lower wages and salaries than do large producers.

The first section of the paper examines the extent to which producers of different sizes pay different wages and whether this differential has grown over time. It then examines the extent to which the difference between the employment growth in small and large producers is related to changes in their relative wage rates. If small producers have been paying increasingly lower wages, the growth in the share of employment in small producers may have been primarily the result of this change in relative wage rates. Therefore, the second section investigates whether the results showing that small producers outperform large producers in terms of employment creation change when wage-rate differentials are taken into account.

The second section of the paper modifies the measure of job-growth that is used to evaluate the dynamism of small as opposed to large producers but maintains jobs or employment as the metric used to evaluate the importance of small producers. This assumption is relaxed in the third section of the paper. Here, the share of small producers' output is examined and compared to changes in small producers' share of employment. This section also investigates differences in the trend of labour productivity in small and large producers.

The investigations are carried out using longitudinal panel data derived from Statistics Canada's Census of Manufactures, an accurate and comprehensive data base that tracks individual establishments annually over the period 1973-1992. The details of the construction of similar data sets and the tests that have been employed on them can be found in Baldwin and Gorecki (1990a, 1990b). For the purpose of this study, two files are used. One covers the period from 1970 to 1988 and is based on the 1970 SIC code. This is used to generate job growth and decline by size class so as to provide data that are comparable to those reported in Baldwin and Picot (1995). A second file using 1980 SIC codes is used to provide more timely data that follow the manufacturing sector into the 1992 recession.

The unit of analysis used to investigate the difference between small and large producers is the production establishment, that is, head offices that are located as separate establishments are excluded. Employment is defined as the sum of the number of production workers and salaried workers. Throughout the analysis, the

discussion will revolve around distinctions between large and small producer performance. It should be noted that there is no universally acceptable definition of large versus small. The convention that will be used here defines small plants to be those with less than 100 employees. Medium-sized plants are those with between 100 and 500 employees. Large plants are those with more than 500 employees. There are also gradations within the small, medium, and large classes that will be used from time to time in the analysis.

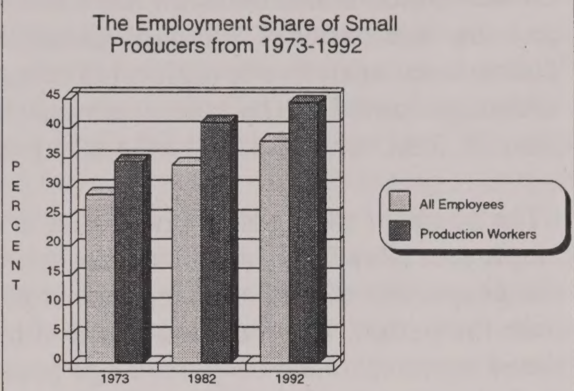

Figure 1

The Distribution of Employment by Size Class

Small producers have become increasingly important employers in the Canadian manufacturing sector in the last two decades. This can be demonstrated either by examining the distribution of production workers alone or the distribution of production workers and salaried employees (total employees). Figure 1 plots the share of total employment in 1973, 1982, and 1992 in all plants (exclusive of head offices) with less than 100 employees. Figure 1 also plots the share of production workers in plants (exclusive of head offices) with less than 100 production workers. In the first case, plants with less than 100 employees accounted for 28.8% of total employment in 1973 but 38.5% of employment in 1992. In the second case, plants with less than 100 production workers accounted for 34.4% of all production workers in 1973 but 44.5% in 1992. There is a large increase in both cases in the share of employment in small plants.

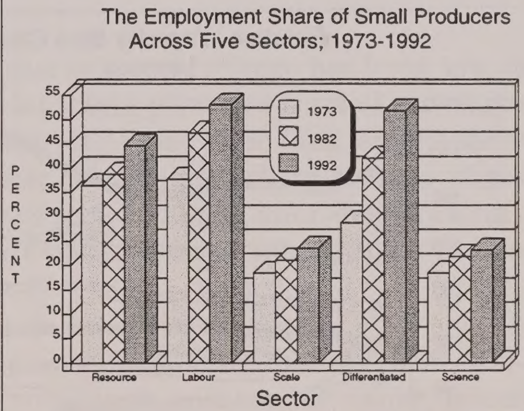

Figure 2

These changes are widespread across different sectors of the Canadian manufacturing sector. To illustrate this, all 4-digit

manufacturing industries were classified into one of five groups: resource-based, labour-intensive, scale-related, product-differentiated, and science-based. These categories were based on a taxonomy outlined by the Organization for Economic Cooperation and Development (OECD, 1987, chapter 7, Annex A). Canadian industries were assigned to the classification employed by the OECD using the Statistics Canada concordance between the Canadian Standard Industrial Classification (SIC) and the International Standard Classification (ISIC) used by the OECD. Then a discriminant analysis was performed using variables such as wage rate, percent of value added accounted for by labour remuneration, concentration, economies of scale estimates, R&D intensity, and advertising-to-sales ratios to verify the classification.[4]

The share of total employment that is accounted for by plants with less than 100 employees in each of these five sectors is tabulated in Figure 2. In each of the sectors, the proportion of total employment in plants with less than 100 employees increases over the period. The increase is largest in the labour-intensive and product differentiated sectors, 16 and 23 percentage points respectively.[5] But it also increases in the scale-based and the science-based sectors, where average plant size is largest. Thus, changes in the employment distribution that see small plants becoming more important occur across all five sectors.

The Wage Rate Differential Between Small and Large Plants

Three characteristics of the wage structure across establishments suggest that corrections for wage differentials may affect previous conclusions that small firms are the most dynamic forces in the job market. First, there are considerable differences in wages paid by large and small plants. Second, these differentials have increased over the 1970s and 1980s. Third, new jobs have been paying increasingly lower wages. These

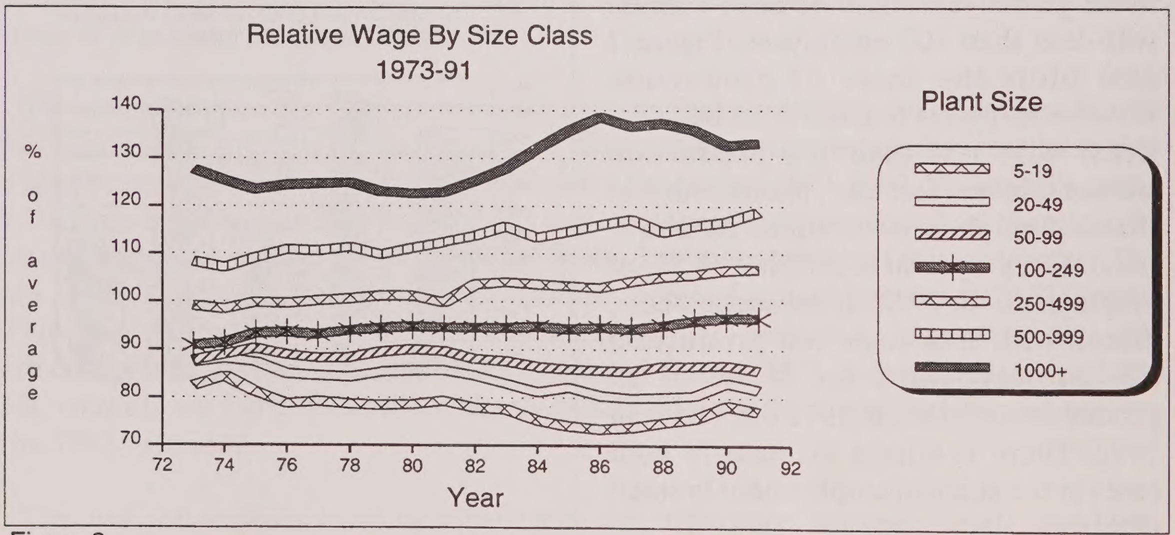

Figure 3

characteristics of the wage structure across establishments suggest that corrections for wage differentials may affect previous conclusions that small producers are the most dynamic force in the job market. Each of these characteristics will be discussed in turn.

Although smaller plants have been increasing their share of employment, the jobs in smaller plants receive lower pay. An employee in small plants receives a lower annual income than elsewhere, either because the hourly wage rate is lower or because the number of hours worked is less. In 1973, plants that possessed between 5 and 19 employees paid only 84 per cent of the national average.[6] On the other hand, plants with more than 1000 employees paid 121 per cent of the national average.[7] Equally significant, the differential between small and large plants has been changing over time (Figure 3). The relative wage of plants between 5 and 19 workers has fallen from 84 per cent of the national average in 1973 to 76 per cent by 1991. Plants in the size classes possessing 20-49 and 50-99 workers also suffered a decline in relative wages. On the other hand, plants with more than 100 employees experienced an increase in their relative wage. Much of the decline in the smallest size class (5-19 employees) occurs before 1986; the relative increase in the largest size class (1000+ employees) peaks by 1986. The relative increase in the medium size class (100-499 employees) occurs more or less continuously throughout the period. In conclusion, not only are jobs in small plants worth less than jobs in larger plants, but they have also declined in relative value over most of the period. It is this decline that would make the relative increase in total employment in the smaller size classes larger than it was, corrected for changing wage patterns.

The relative wage change depicted in Figure 3 may be the result of structural change. If employment has shifted from industries where plants are larger on average and where wages are higher, to industries where plants are smaller on average and where wages are lower, then smaller plants would account for a larger share of employment and would pay relatively lower wage rates.

Baldwin and Rafiquzzaman (1994) show that structural change has been associated with declining employment in those industries where plant size is small and wages are relatively low (such as labour-intensive industries); at the same time, employment has been increasing in industries where plant size is larger and where average wages are higher (such as scale-based and science-based sectors). Thus, inter-industry structural change does not appear to be at the heart of the shift of employment to smaller producers in the manufacturing sector.

To confirm this, the relative wage rate[8] of each of three size classes (0-99, 100-499, 500+ employees) was calculated for the five sectors—resource-intensive, labour-intensive, scale-based, product-differentiated, and science-based—in each of 1973, 1982, and 1992 and plotted in Figure 4.[9] In each case, the relative wage for the smallest class declines and the relative wage of the largest size class increases. The least amount of change occurs in the labour intensive sector; but elsewhere the difference between the smallest and the largest widens considerably over the period. A better idea of the difference that developed between the smallest (0-99) and the largest (500+) is

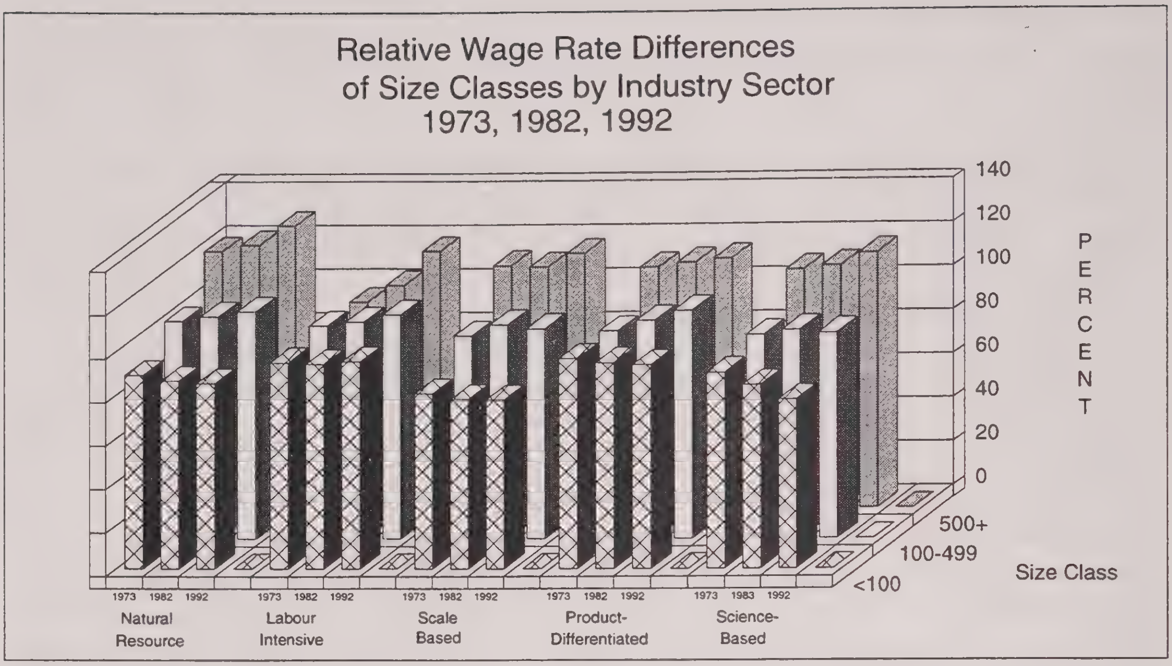

Figure 4

obtained by comparing the relative wage of the smallest to the largest (as opposed to the average). This is plotted in Figure 5 for the five different sectors along with manufacturing as a whole. The relative wage of the smallest size class in all sectors declines over the period—with the largest changes occurring in the product-differentiated and the science-based sectors. The cause of the decline in relative wages in smaller producers then must be found in a general phenomenon that has affected many different industries.

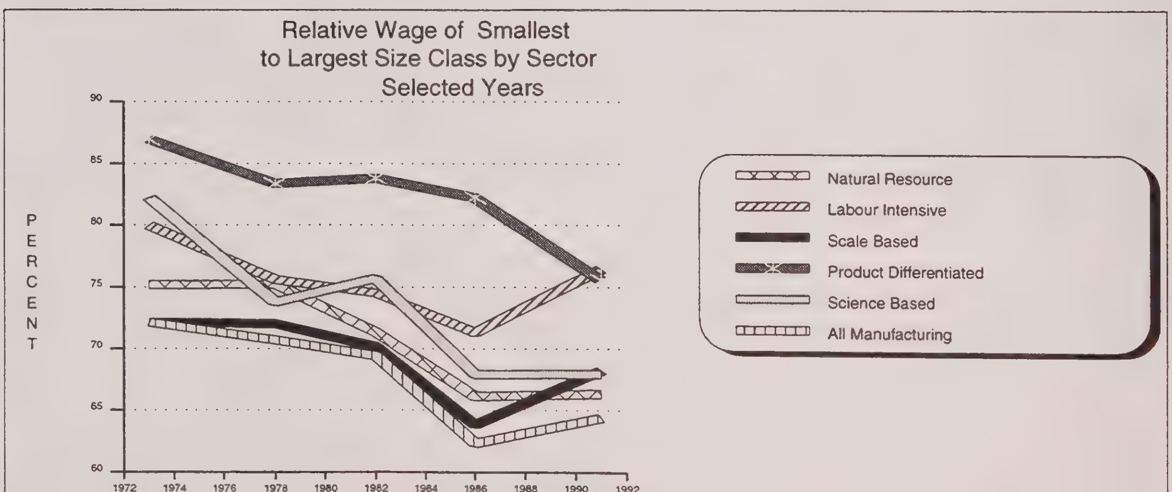

Figure 5

If jobs are valued by the remuneration that is attached to them, jobs in small plants are worth less than those in large plants. Small plants may be producing more new openings, but these jobs have increasingly paid less than jobs in large plants and no account is taken of this differential in the debate over the relative dynamism of the two sectors.

In order to take account of the difference in relative wages between small and large producers, this study defines a new measure of employment that standardizes a job by the wage paid. The new measure weights employment in each plant by the ratio of the plant's average wage to the average wage paid by all plants. This is equivalent to defining employment in a plant (the *equivalent employment unit* -- EEP) as total wages in that plant divided by the average wage rate (total annual remuneration) in all plants.

Let $e_t =$ employment in plant t, t = 1,...N

$w_t =$ wage in plant t, t = 1,...N

$$E_t = \text{total employment} = \sum_{i=1}^{N} e_t$$

$$\text{and } W = \text{average wage} = \frac{\sum_{i=1}^{N} w_t}{\sum_{i=1}^{N} e_t}$$

$$\textit{Then } EEP = e_t * \left\{\frac{w_t}{W}\right\} \text{ and } \sum EEP = \sum e_t$$

The equivalent employment unit is calculated by dividing the yearly wage bill for both production and non-production workers in a plant by the average yearly income of all workers in the manufacturing sector. The latter is calculated for all establishments not classified as head offices using wages paid to production workers plus salaries paid to non-production workers divided by all production and non-production workers. This new unit of employment (the *equivalent employment unit* or *EEP*) will be less than the normal employment measure if a plant pays lower hourly rates or employs more workers with shorter hours (uses more part-time workers). For example, a plant with a wage rate that is only half of the average will have an equivalent employment that is only half the employment that is actually registered. A plant that pays twice the normal wage will have equivalent employment that is twice the employment normally registered. Similarly, if a plant provides less than the average number of hours worked per employee, its equivalent employment will be reduced relative to those plants that provide more hours per person than the national average. The sum of equivalent

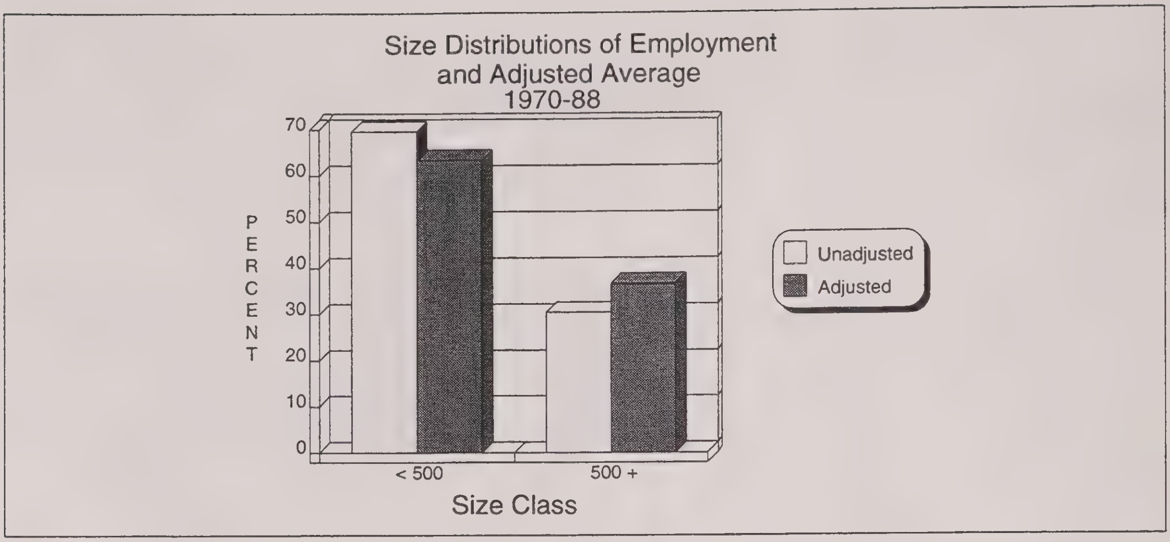

Figure 6

employment across all plants for any one year will be equal to the sum of all employment.

When the correction is made to employment for differences in wages paid, the distribution of employment changes. The percentage distribution of employment using the unadjusted employment and the wage-equivalent employment (EEP) is presented in Figure 6. With these corrections, the average share of employment over the period 1970-88 in plants over 500 employees increases from 30 to 36 percent. The share of smaller plants below 500 workers decreases from 70% to 64%. The corrections for remuneration differences (both hourly wage rates and hours-worked) then increases the relative importance of large plants and decreases the relative importance of small plants.

The payment of lower wages by smaller producers will result in the employment-corrected measure being lower in small firms; but it will not necessarily change the relative importance of small producers in *creating* new jobs, in affecting the difference between the growth in jobs in some small producers and the loss of jobs in other small producers. For the correction to affect estimates of the rate of change in new jobs, the remuneration paid by incumbent continuing producers that are increasing employment (growers) must change relative to those whose employment is contracting (decliners). If, as well, the remuneration paid by births falls over time relative to the remuneration paid by exits, then using the wage-corrected employment measures will cause employment in births to fall relative to deaths. This will decrease the net difference in employment creation resulting from births and the employment loss associated with deaths, or the net job creation rate. Since most births and deaths are small, this will decrease the net contribution to job growth that small producers make to net job creation. The same effect will occur if the smaller continuing establishments that grow gradually pay relatively less than the smaller continuing establishments that contract.

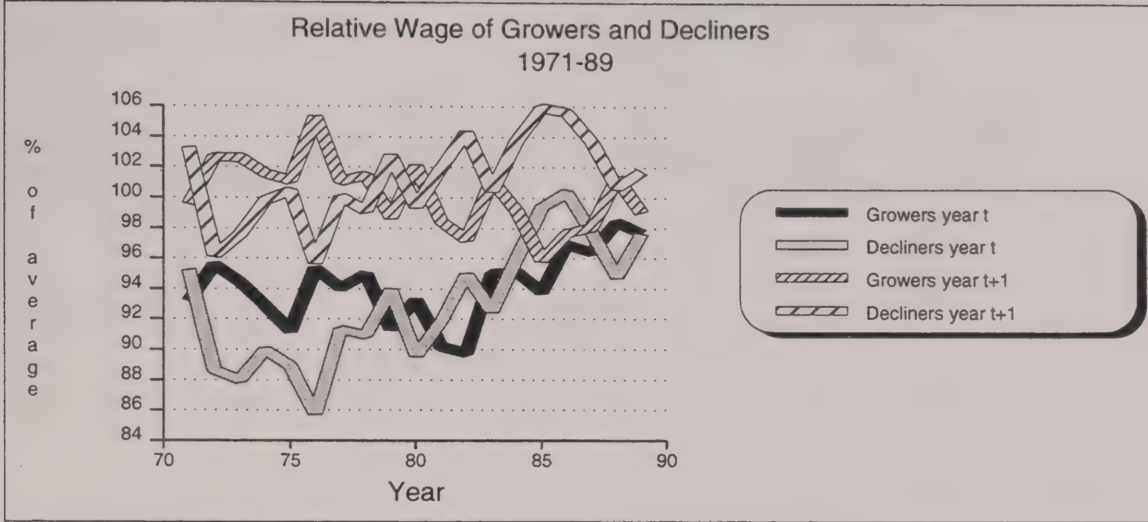

Figure 7

In this case, the net contribution of small producers to the job creation process will decline after corrections are made for changing wage-rate differentials.

To investigate whether wage differentials between growing and declining producers have changed, establishments were divided into two groups—continuing establishments that gained employment and continuing establishments that lost employment between two years. The average wage or remuneration paid (the sum of annual wages and salaries divided by total annual employment) of each group was then calculated and indexed to the average wage in all of manufacturing. This was done twice, once for the initial and once for the terminal year of the comparison (both were indexed to the final year average wage rate), and plotted each year from 1971 to 1989 (Figure 7).

In the 1970s, the wage of continuing growing plants was generally above that of continuing declining plants, both in the initial year and the terminal year of the comparison. The process of job growth and decline that transfers employment from those with low income to those with higher income served to increase the average income level in the 1970s as the relative share of employment was shifted from declining to growing plants. This process does not occur in the 1980s. In the early years of this decade, there is no consistent difference between the relative wage of growers and decliners; but, in the final years, decliners are more likely to be paying higher wage rates. Plants that were losing employment were more likely to be paying higher wages than plants that were adding employment.

Continuing establishments make up only part of the population; births and deaths make up the other. In order to investigate whether the same change was occurring in this subset, the average wage of births and deaths relative to continuing establishments was calculated. This is plotted in Figure 8, along with the relative remuneration of growing and declining continuing plants from Figure 7. In the 1970s, the relative wage of births is much higher than that of deaths. In the early 1980s, the relative wage of

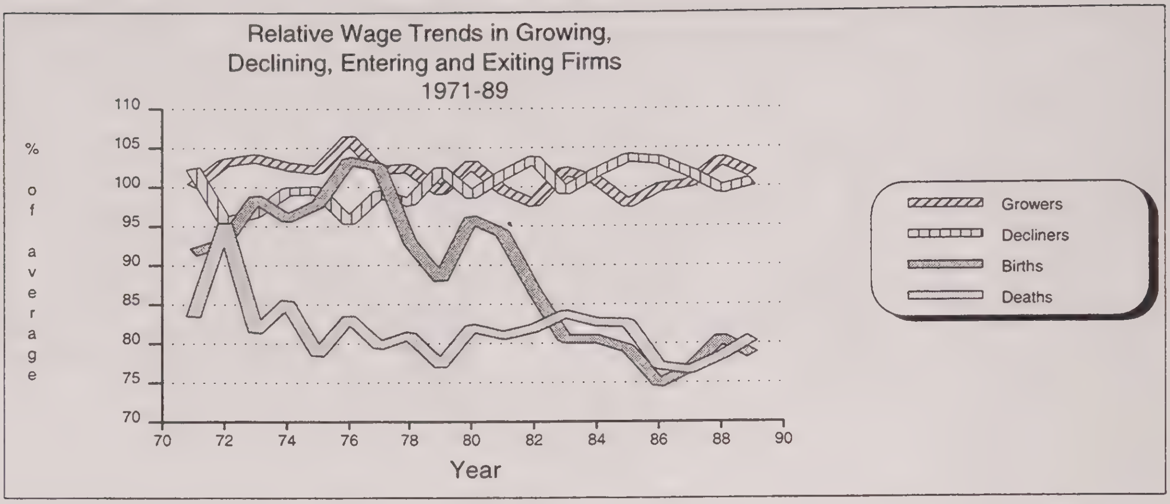

Figure 8

births falls dramatically. By the late 1980s, there is virtually no difference between the wages paid by births as opposed to deaths. This change parallels that found in the continuing sector—though the differences between entrants and exits is larger in the 1970s for births and deaths than it is for growing and declining continuing plants. Moreover, the convergence takes somewhat longer for births and deaths.

Since the wage of plants where employment is growing gradually falls relative to plants where employment is declining, a correction for the difference in wages paid to growing and declining producers will decrease the amount of job growth relative to the amount of job loss over time. This will make the net employment change less. Whether it affects the relative contribution that smaller producers make to job creation will depend upon the extent to which the change that is depicted in Figures 7 and 8 is felt differentially in small and large producers. This is investigated in the following section.

Measures of Job-Change Corrected for Wage-Rate Differentials

Wages have fallen over time in small relative to large producers. Wages have also declined in growing relative to declining producers. To sort out how these two factors impact on the previous findings (Baldwin and Picot, 1995) that small producers are the only ones creating jobs on balance, a new measure of employment is created that takes into account the quality of the job. Then the rates of job growth and destruction for different size classes are calculated using this new employment measure.

The relative performance of small and large producers will be measured here in terms of the change in the equivalent employment (EEP) between years, using micro data collected at the establishment level. Equivalent employment is derived from both production and non-production worker data. For short-run calculations, employment changes are measured between adjacent years. For longer-run calculations, changes are measured over a five-year period.

Job change between two years t and t+ 1 is measured by:

a) *gross job creation* in period t to t+ 1—the summation of equivalent employment gains for all plants that expanded equivalent employment between periods t and t+ 1. This includes employment creation both in new plants and in continuing plants whose employment grew.

b) *gross job destruction* in period t to t+ 1—the summation of equivalent employment losses for all plants that contracted equivalent employment between periods t and t+ 1. This includes employment destruction both in closures and in continuing plants whose employment declined.

c) *net employment change* in period t to t+ 1—the difference in equivalent employment between t and t+ 1. This is equal to the difference between gross job creation and gross job destruction.

The calculations for job-growth were derived from a longitudinal plant-level data base that was constructed from an annual census of manufacturing plants. The panel covers the period from 1973 to 1992. The focus of the paper is on the Canadian manufacturing sector since the longest string of data is available for this sector and earnings per worker is available at the plant level.

Establishments are linked to owning enterprises in this data base and, therefore, changes both at the plant and the firm level can be calculated. This study examines only plant level data because it is interested in examining the extent to which employment distribution at the lowest level—the plant—has been experiencing a change. Shifts in distributions calculated at this level are most likely to be associated with changes in underlying technology. Employment distributions estimated at higher levels of aggregation—at the firm level—are different from those at the plant level, both because the underlying technology may have come to increasingly favour smaller plants and also because something in the nature of organizational structure may favour fewer multi-plant firms and, thus, a downsizing of the firm.

The data used to estimate job-change rates are comparable to the American data used by Davis, Haltiwanger, and Schuh (1993). A similar source was used to calculate the job-change rates reported in Baldwin and Picot (1995). Since a comparison to this earlier work is useful, definitions that were used previously for the calculation of job growth and job decline are used here so as to provide comparability to the U.S. results.[10]

In order to transform gross job creation and destruction into measures of *rates* of job creation and destruction, employment change is divided by a measure of plant size. The most commonly used measure of employment is the *base-period size measure* (t). To the extent that there is transitory employment change in any population of producers, this measure will be unduly small for small plants and too large for large plants. If, in any one period, plants that are smaller are more likely to have just declined and to reverse

themselves in the next period, and if large plants are more likely to have just grown and to reverse themselves in the next period, then the use of the base-period year will bias job-growth rates upward for small plants and downward for larger plants. Following Davis, Haltiwanger, and Schuh (1993), an additional size measure is employed to correct for this problem. Davis, Haltiwanger and Schuh (1993) use average plant size over the year t and t+ 1—the period over which employment change is measured. This will be referred to as the *current-period average size measure.*[11] If most of the transitory movement is reversed within two-year periods, the two-year average will correct for this phenomenon.

The fact that small firms are dynamic forces in job creation may be manifested in several ways. First, new producers may be emerging that are generally smaller and this may cause the employment size distribution to shift. This phenomenon will be accompanied both by an increase in the employment accounted for by small producers and by job-growth rates that indicate small firms are creating more new jobs than large firms. It is essentially this phenomenon that the base- and current-period measures capture. However, there is a second, different way that small firms may be said to be a dynamic force even if the employment size distribution is not changing to favour more small firms. If new small firms grow to replace older larger firms, the industrial population can be said to be renewed by small firms. The latter may be said to involve longer-run regression-to-the-mean.

It is therefore, useful to distinguish between changes that are taking place both in a distribution of plant sizes and within the size distribution. Calculating job change between adjacent years captures the changes that are taking place in the size distribution. These changes will be influenced by a myriad of factors—the business cycle, the extent to which small or large producers are growing in importance. They will not capture major changes that are occurring within the plant-size distribution if small producers are growing to become large and if large producers are declining to become small.

In order to shed light on the nature of the structural (longer-term) growth and decline in different portions of the plant-size distribution, the growth and decline rates are also calculated over five-year periods (See Baldwin and Gorecki, 1990a). This is the *long-run five-year cumulative rate* of job creation and destruction. Plants are classified as growing or declining on the basis of their employment change between t and t+ 5 (as opposed to between t and t+ 1 in the previous exercise) and then their cumulative performance over 5 years is calculated. Use of the longer period for classification, as opposed to the one-year period previously used to classify plants as growers or decliners, permits longer-run change within the size distribution to be investigated. For the five-year cumulative rate of change measure, employment change is divided by plant size, which is defined as the average over the two years t and t-1.

While all calculations are based on the equivalent employment of the plant, size-class assignments for each plant are made on the basis of actual employment to facilitate comparisons with previous work. All rates of change for plants within a size class are

Table 1

Job Turnover By Size Class Using Employment and Base-Period Size (average 1970-88)— Percent

Size Class	Job Change Using Base-Period Plant Size		
	Job Creation	Job Destruction	Net Change
0 to 19	28.8	17.5	11.3
20 to 49	18.0	14.2	3.8
50 to 99	12.6	11.9	0.7
100 to 249	9.0	9.8	-0.8
250 to 499	6.8	8.4	-1.6
500 to 999	5.1	7.2	-2.1
1000 +	4.7	6.2	-1.5

Table 2

Job Turnover By Size Class Using Equivalent Employment and Base-Period Size (average 1970-88)—Percent

Size Class	Job Change Using Base-Period Plant Size		
	Job Creation	Job Destruction	Net Change
0 to 19	27.3	11.0	16.3
20 to 49	17.3	8.6	8.7
50 to 99	12.9	7.3	5.6
100 to 249	9.5	6.0	3.5
250 to 499	7.5	5.4	2.1
500 to 999	5.8	5.0	0.8
1000 +	5.5	4.5	1.0

weighted by the share of employment of the plant—that is the rates are always calculated as the sum of all employment change of plants within the size class divided by the total employment of plants within the size class.

The Relative Importance of Small and Large Producer Job Change

Short Run

The rates of job change for actual employment and for the employment equivalent unit for the base-period calculation method are presented in Tables 1 and 2 respectively. When no corrections are made for differences in wage rates (Table 1), smaller plants have higher rates of job growth and job destruction than larger plants. For example, plants with less than 20 employees have a 28.8% gross job-creation rate while plants with more than 1000 employees have only a 4.7% gross job-creation rate. The gross job-destruction rates for these two classes are 17.5% and 6.2% respectively. More importantly, smaller plants contribute positively to net employment change while larger plants exhibit negative rates of net employment change. Size classes up to 100 workers have a positive rate of net employment change and those above 100 workers have negative net employment change. It is this result that is used to argue that small plants are the dominant source of new jobs. In the face of the negative rate of employment change in larger plants, the positive rate of employment change in small plants means the latter is the only source of net employment change.

When equivalent employment units are used (Table 2), smaller plants still have higher rates of gross job creation and gross job destruction than larger plants. While the net rates of job creation are still higher for the small plants, the large plants now have positive rates of net employment growth. Large plants are no longer definitively in decline.

These base-period rates of change have been criticized for overemphasizing growth in small plants relative to large because they do not take into account the natural regression-to-the-mean that takes place in many populations. If small plants contain a disproportionate share of producers that have temporarily declined and that are about to return to their longer-run size, use of base-period size will increase the rate of change for small producers relative to that which would have been calculated using an average size over the longer period. The opposite will occur for larger producers. Whether regression-to-the-mean is an important problem is an empirical issue. For the Canadian manufacturing sector, Baldwin and Picot (1995) demonstrate that, for calculations using employment, small producers contribute positively to job growth while large producers have the opposite effect, irrespective of the method chosen to account for possible short-run regression-to-the-mean.

In order to test the robustness of the findings that are based on a wage-corrected equivalent employment measure, a second calculation—the current-period rate of change—is presented in Table 3 for the regular employment measure and Table 4 for

Table 3

Job Turnover By Size Class Using Employment and Current-Period Size (average 1970-88)—Percent

Size Class	Job Change Using Base-Period Plant Size		
	Job Creation	Job Destruction	Net Change
0 to 19	25.2	23.1	2.1
20 to 49	18.1	14.9	3.2
50 to 99	13.3	11.3	2.0
100 to 249	9.9	8.7	1.2
250 to 499	7.8	7.2	0.6
500 to 999	6.3	6.5	-0.2
1000 +	5.4	5.3	0.1

Table 4

Job Turnover By Size Class Using Equivalent Employment and Current-Period Size (average 1970-88)—Percent

Size Class	Job Change Using Base-Period Plant Size		
	Job Creation	Job Destruction	Net Change
0 to 19	22.1	20.9	1.2
20 to 49	15.9	12.9	3.0
50 to 99	11.9	9.8	2.1
100 to 249	9.2	7.6	1.6
250 to 499	7.2	6.2	0.9
500 to 999	6.1	5.5	0.6
1000 +	5.4	4.5	0.9

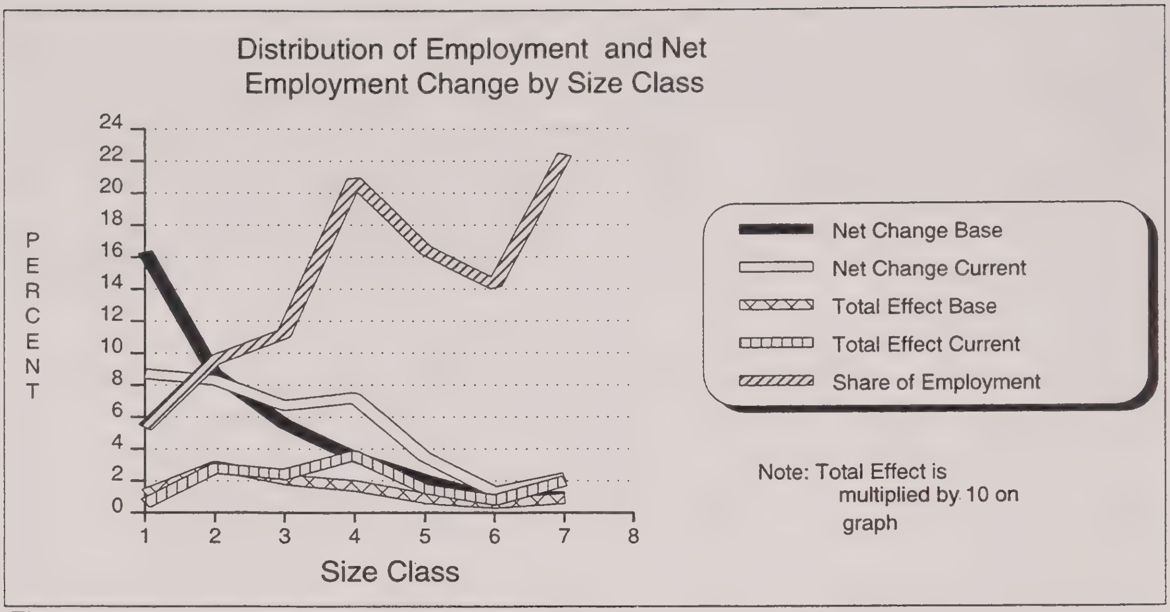

Figure 9

the equivalent employment measure. Current-period rates of change in Table 3 show smaller producers with positive net rates of change and some larger producers with negative rates of change. Once more, when employment-equivalent units are used (Table 4), large producers no longer have negative rates. Moreover, when corrections are made for regression-to-the-mean, the net rates of change for large plants are not that much smaller than the net rates of job change for smaller plants. The net job-change rate for plants of less than 20 employees is 1.2%; for plants over 1000 employees, it is 0.9%.

Since large plants no longer have negative rates of change when corrections are made for relative wage rates, it is not possible *a priori* to claim that these plants have *little or no influence* on the job creation process. To evaluate the contribution that a size class makes to the share of jobs being created, both the net rate of change and the importance of the size class have to be considered simultaneously. A 1% increase in a plant that has 1000 workers would add 10 workers to the work force; a 20% increase in a plant that has 20 workers adds only 4 workers. Percentage point changes then are not very good indicators of the relative importance of job creation in different size classes.

The impact on total employment of change within each size class depends on the number of workers in each size class as well as the rate of net employment change in that size class. The impact of change in a size class on overall employment is the product of the net rate of job change (n_t) and the share of total employment in the size class (s_t)--the rate of job change expressed as a percentage of total employment across all size classes--what is referred to as the total effect in Figure 9.

If $n_t = \dfrac{\Delta e_t}{E_t}$ and $s_t = \dfrac{\Delta E_t}{E}$

where $\Delta e_t =$ change in employment in size class t

$E_t =$ employment in size class t

$E = \sum E_t =$ total employment

then $t_t = n_t \times s_t = \dfrac{\Delta e_t}{E} =$ change in employment in size class t as a proportion of total employment

This measure can be used to evaluate the relative size of job creation by size class. Figure 9 contains the share of equivalent employment for each size class and the net employment rate of change using the base-period rate of change. While small size classes have a much higher rate of net employment change than the larger size classes, their employment share is much lower. The smallest size class (less than 20 employees) has only about 5% of employment; the largest has over 22%. The total impact--the net rate of employment change multiplied by the employment share of the size class (the contribution made to total employment by expansion and contraction of the size class) is also graphed in Figure 9. The largest size class contains 22% of employment. Its 0.9% net change in employment, calculated using the base-period average size measure, increases total employment by .22%. The smallest size class contains some 5.3% of employment. Its 16.3% net change in employment using the base-period method increases total employment by .87%. While small plants then still have a relatively greater affect on total employment than large plants, after wage differentials are factored into the calculation, the effect of large plants cannot be ignored. Employment change for the largest size class is about one-quarter of that of the smallest size class.

These results, calculated for the base-period measure, are the most favourable to small producers. The current-period results (Table 4), which correct for regression-to-the-mean problems show smaller differences in the net rate of job change between the smallest and the largest plant-size classes. Figure 9 also contains the impact on total employment--the product of the net rate of change and the share of employment--calculated for each size class using the current-period estimates. It is now the case that the largest class makes a greater contribution to total employment change than the smallest class. Average annual growth in the smallest class is equal to .06% of total employment; average annual growth in the largest class contributes .20% on average. The largest increase occurs not in small plants (0-99 employees), but in medium-sized plants (100-249 employees).

Table 5

Job Turnover By Size Class Using Employment and 5-Year Long-Run Cumulative Measure (average 1970-84)—Percent

Size Class	Job Change Using Previous Period Average Plant Size		
	Job Creation	Job Destruction	Net Change
0 to 19	134.4	42.9	91.5
20 to 49	84.7	32.8	51.9
50 to 99	55.0	27.7	27.3
100 to 249	31.8	24.5	7.3
250 to 499	19.2	22.2	-3.0
500 to 999	14.6	19.6	-5.0
1000 +	12.3	15.1	-2.8

Table 6

Job Turnover By Size Class Using Equivalent Employment and 5-Year Long-Run Cumulative Measure (average 1970-84)—Percent

Size Class	Job Change Using Previous-Period Average Plant Size		
	Job Creation	Job Destruction	Net Change
0 to 19	121.4	40.9	80.5
20 to 49	75.9	31.5	44.4
50 to 99	50.6	26.7	23.9
100 to 249	30.5	23.8	6.7
250 to 499	19.1	21.7	-2.6
500 to 999	14.9	19.0	-4.1
1000 +	12.7	14.7	-2.0

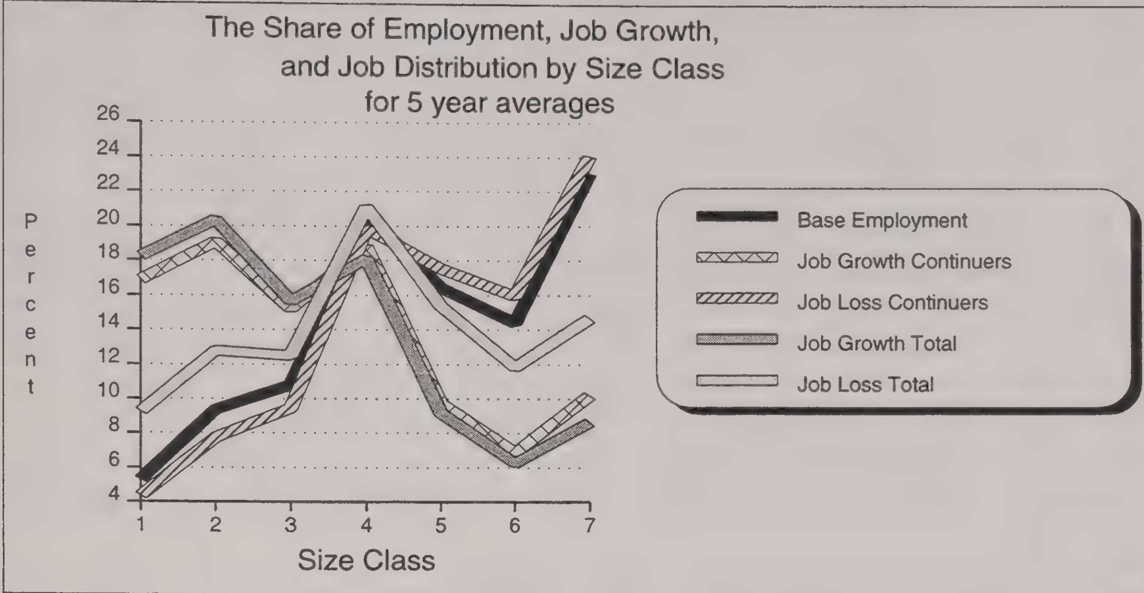

Figure 10

Longer Run

The previous section has demonstrated that when annual changes in employment are examined and the wages attached to these jobs are considered, the relative importance of smaller plants declines. But annual employment changes only capture part of the dynamics that affect growth and decline. They measure only short-run rates of change that affect the plant-size distribution. In the short run, there may be little change in the relative size of individual producers. In the long-run, there may be considerably more movement of producers within a size distribution as large producers decline and small producers grow.

To evaluate the longer-run components of growth and decline, change over five-year periods is examined.[12] Rates of job growth and decline over five-year periods will contain both short- and long-run movements, but will be different from the annual changes to the extent that structural change in the longer run is important.

The comparisons of 5-year job change using employment and the equivalent-employment concept that corrects for wage-rate differences are presented in Tables 5 and 6, respectively. Using unadjusted employment (Table 5), the net rate of change over five-year periods averages 91.5% for plants with less than 20 employees and decreases to become negative (-2.8%) for plants with more than 1000 employees (Table 5). Smaller plants are growing and larger plants are declining. When the corrections for wage differences are made (Table 6), net employment growth declines to 80.5% for the smaller plants and increases for the larger plants. Nevertheless, it remains negative (-2.0%) for the largest plant size classes (above 1000 employees). In both cases, then,

growth occurs across a large number of the smallest size classes. The largest size classes have negative net growth, irrespective of the whether the wage-corrected measure is or is not used. Making corrections for the metric used to measure employment does not alter the conclusion that there is substantial turnover within the size distribution in the longer run. Small firms grow to replace large firms.

The mechanism that is generating this change is best illustrated by measures of the share of job growth and decline by size class. The distributions of the share of job growth and job decline for the long-run cumulative five-year rates using equivalent employment are presented in Figure 10 for continuers (producers that can be found at the beginning and end years of every five-year period used) and for all producers (both continuers as well as births and deaths). The distribution of the share of job destruction for continuers by size class is very similar to the share of employment. Job decline appears as a random process distributing job destruction much as original employment. The share of job gain in the larger plant size classes is less than their share of employment. It is, therefore, primarily the dynamics on the job-gain side that account for the decline of larger producers in the longer run. Large producers are not declining at a particularly high rate. They simply are not growing, at least in terms of employment, at a rate proportional to their existing share of employment.

When entry and exit is added to growth and decline in continuers, the share of both growth and decliners in the smallest size classes increases; nevertheless, the share of growers in these classes still is greater than the share of decliners. The reverse is true for the larger size classes.

In conclusion, revising the metric used to measure employment reverses one but not both of the conclusions about the importance of small producers. Previously, it had been observed that the increase in the share of employment in small firms came both from small firm growth and from large firm decline. This conclusion is now modified. Small firms are not becoming as important using short-run calculations. When the wage corrections are made, larger firms are found to contribute positively to job growth. Even though their share is falling, they have increased their wage-adjusted employment on average over the last two decades. However, the conclusion that small producers provide long-term renewal to the system is not changed by using wage-corrected employment measures. Here the evidence is still overpowering that small firms grow in the longer run and that in general larger firms are in decline.

Small Producers and Output Share

When the metric that is used to measure the importance of small producers is changed from that of employment to wage-corrected employment, the conclusion that only small producers are contributing to job growth is no longer valid. Large plants are, on average, contributing to job growth over the period, but it is less than small firms so that the share of the latter gradually increases. For example, plants with less than 100 employees had 21% of wage-equivalent employment in 1982 and this had crept up to 31.8% by 1992.

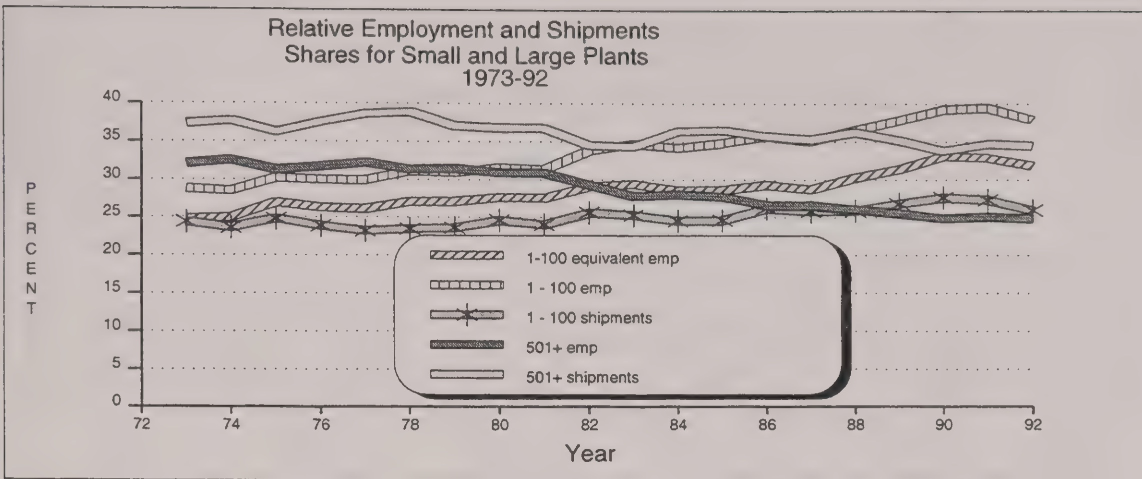

Figure 11

There are, however, other metrics that can also be used to measure the importance of small producers besides employment. Employment measures an input and only one input out of many. Alternately, a study of the importance of small producers could use outputs—a measure of the value of the output of the goods produced.

Output shares and input shares do not necessarily have to move in the same direction. The employment shares of small producers could increase while the output shares are declining. This result would necessarily be accompanied by a declining relative labour productivity in smaller plants, since the course of relative labour productivity is derived by dividing relative output by relative employment.

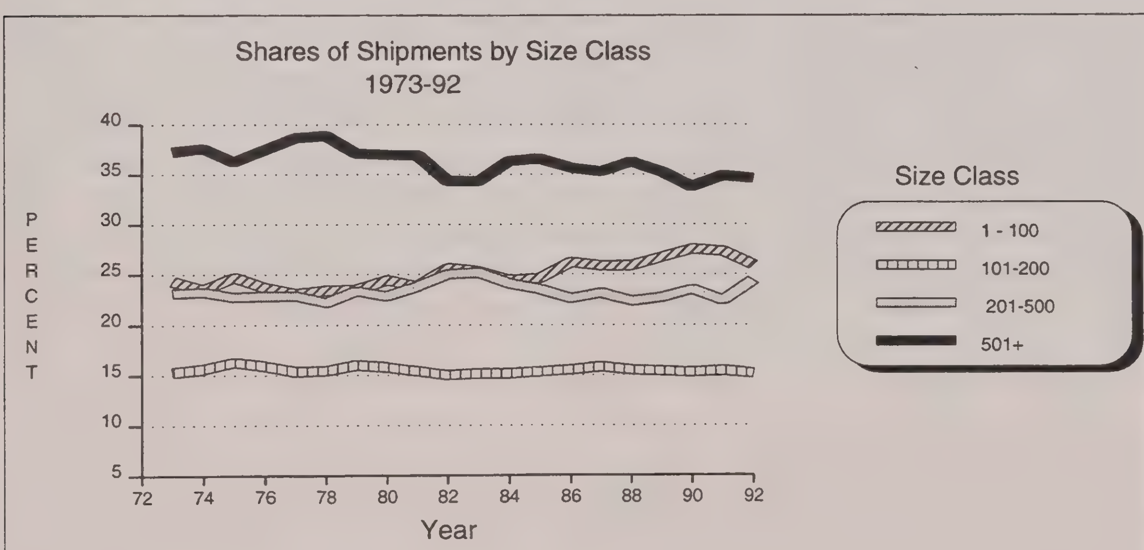

Figure 12

Table 7

Regressions on Time of Output and Employment Shares

Share	Regression Coefficient	Standard Error	T Statistic	Prob > |T|
Employment Share				
Plants ≤ 100 *	.0057	.00030	18.87	.0001
Plants 101-200 *	.0002	.00015	1.65	.1163
Plants 201-500 *	-.0014	.00022	-6.339	.0001
Plants 501+ *	-.0045	.00027	-16.846	.0001
Equivalent Employment Share				
Plants ≤ 100 *	.0038	.00031	12.47	.0001
Shipments Share				
Plants ≤ 100 *	.0018	.00029	6.39	.0001
Plants 101-200 *	-.0002	.00011	-1.79	.0894
Plants 201-500 *	.0002	.00032	0.668	.5128
Plants 501+ *	-.0018	.00038	-4.897	.0001

* employment

Shares of output for different size classes can be measured using shipments, production, or value-added. Since the results yielded by all three measures are essentially the same, only those using shipments are reported here.[13] Figure 11 contains the shares of employment (wage and salaried workers uncorrected for remuneration differences) and of shipments of all establishments except head offices over the period from 1973 to 1992 for plants of less than 100 employees and for plants of greater than 500 employees. The employment share of the smallest size class increases dramatically from 28.8% to 37.9% (9.1 percentage points) but its share of shipments increases only from 24.4% to 25.9% (1.5 percentage points). The dramatic surge in the employment share of small plants in the 1980s is accompanied by very little change in output shares. The employment share of plants of more than 500 employees falls from 32.0% to 24.8% (7.2 percentage points) over the same period; its share of shipments falls only from 37.3% to 34.4% (2.9 percentage points). There is little change in the shipment shares of intermediate size classes with between 101 employees and 500 employees (Figure 12).

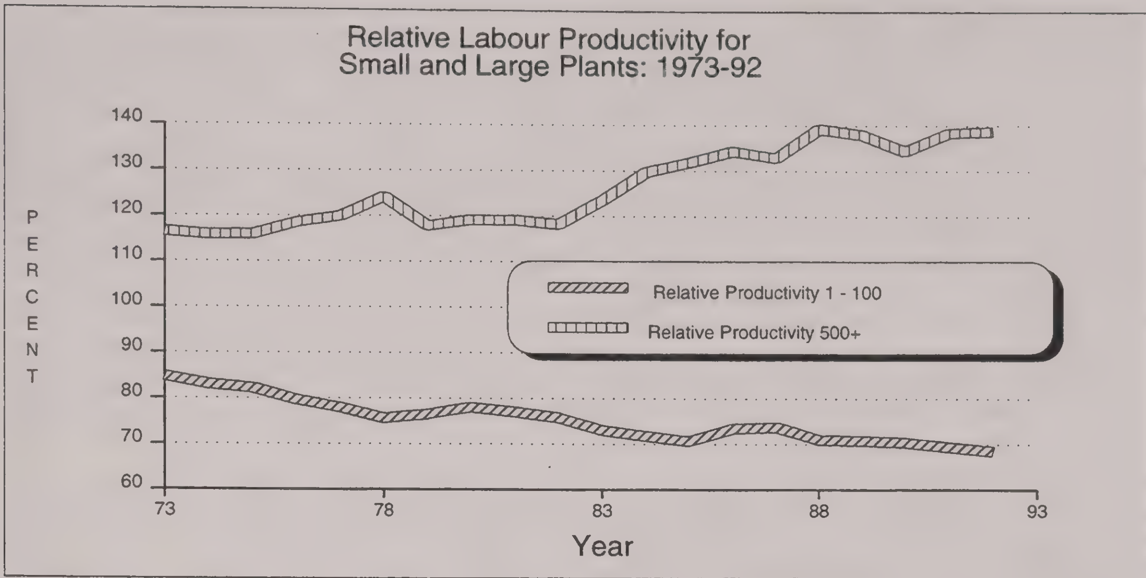

Figure 13

The shares of employment and output are regressed on a time variable (t = 1,2 ...) in order to provide a quantitative evaluation of the difference in the trends of each variable by size class. The coefficients are reported in Table 7. Plants with less than 100 employees have a positive and significant trend in employment share and output share, but the trend coefficient on output is one-third of the trend coefficient on employment. Plants above 200 employees have a negative and significant trend in employment share but only plants above 500 employees have a negative and significant trend coefficient on output.

Since small producers have increased employment share much more rapidly than their share of shipments, their relative labour productivity has fallen. Figure 13 tracks the relative labour productivity (shipment share divided by employment share) of plants with less than 100 employees and of plants with greater than 500 employees. The smaller size class starts at 84% of the average productivity but declines to 68% by the end of the period. The larger plants with more than 500 employees start at 116% of the average and increase to 138% of the average. The labour productivity of the smallest class is only 72% of the labour productivity of the largest at the beginning of the period; it has fallen to 50% of the largest by the end of the period.

Conclusion

Over the past twenty years, small-plant growth in the manufacturing sector has been a dynamic force that has contributed to the growth of employment in this sector. Small plants have had higher rates of job growth than larger plants. Even though their rates of job destruction have also been higher, the difference between job growth and job destruction or net employment change has been positive in small plants while for large plants, net employment change has been negative.

Set against this job performance, however, is the fact that small manufacturing plants have been paying increasingly lower wages than larger plants. The jobs that have been created are of increasingly lower quality as measured by remuneration levels. When corrections are made for this diminution in the quality of jobs offered by smaller plants, the annual rate of job change in smaller plants is reduced; it is increased in larger plants. In addition when allowance is made for the regression-to-the-mean problem, the contribution that larger plants make to annual employment change is found to be important.

Despite these modifications, it is still true that the employment share of small plants, whether uncorrected or corrected for wage rate differences increases over the period of study. However, focusing on employment alone to measure the importance of small plants provides only a partial picture of the economic process. Use of output shares tells a very different story. Small plants have changed their output shares very little over the last two decades. Thus, while smaller producers have become a much more important provider of jobs, they have not become a much more important producer of the output that society consumes.

During the 1980s, larger producers were able to increase their productivity relative to the average quite dramatically. Accompanying this has been a dramatic decline in the relative labour productivity of small producers. Wages have also declined in small relative to the large producers. Thus, while small plants have gained employment share, both their relative productivity and wages have fallen. Since average income or average productivity for the manufacturing sector as a whole is just the employment-weighted average of individual plant incomes and productivity, this trend to increasing employment share but declining relative labour productivity in small plants has contributed to the slowdown in wage and productivity growth (Baldwin, 1996).

The growth of smaller producers as a whole then has had mixed effects. It has provided new jobs; but those jobs have not paid the same wage as the jobs that have been lost as large producers substantially reduced their labour force. To some extent, growth in the small plant segment has probably been the result of wage flexibility in this sector. With increasing unemployment rates in the economy as a whole, the pressure for downward wage flexibility has been manifested most in declining wage rates in the small plant sector. Accompanying this trend has been a falling labour productivity in small plants.

Small producers are often described as the engines of growth. This image conjures up a picture of this group as dynamos who are leading the way in adopting new and more productive technologies and whose expansion due to new sales provides new job opportunities. This image is derived from two quite separate visions of the contribution that small firms are making. On the one hand, it stems from a dynamic life-cycle model of renewal in the industrial population that has small firms with new innovative ideas growing to replace older more moribund large firms. There is strong evidence in this paper and elsewhere (Baldwin, 1995) supporting this view. On the other hand, the growth engine analogy is sometimes also founded on the evidence that the distribution

of employment has become more heavily concentrated in smaller producers and the argument that this shift is beneficial--that this larger group of small firms is providing a greater stimulus to overall growth than they traditionally provided.

The research presented here suggests that the growth of small firms in the manufacturing sector has not fulfilled this latter role. They are not dramatically increasing market share; they are not winning the race either with regards to wages paid or labour productivity. By way of contrast, it is the large producers who have been making the greatest strides in increasing labour productivity in the 1980s. Large plants have been decreasing their relative employment while maintaining their relative output share. Small plants have not been able to maintain their relative labour productivity and have increasingly fallen behind the industry leaders.

There are several possible explanations for this phenomenon. First, small plants may have fallen behind because of an exogenous change in the types of technologies that are presently being adopted by market leaders. These technologies may be more difficult to adapt to small scale situations and small plants may be technological laggards.[14]

There are, however, other explanations for the change in small-plant relative productivity that do not rely upon arguments about changes in technology and their effect on the relative competitiveness of small plants. While relative labour productivity in small plants may have fallen because of exogenous technical change, this decline may have occurred because of a change in factor prices that makes it more profitable to substitute labour for capital. In this case, the reduction in labour productivity is an endogenous reaction to economic events.

The latter explanation of the changes that have occurred cannot be ruled out. During the last two decades, the price of labour has fallen in small relative to large plants as labour was displaced by technical change in the latter sector. Wage flexibility in the smaller sector, perhaps because of lower unionization rates, permitted the smaller plant sector to absorb the displaced labour. Unless the price of capital that small plants faced also declined, the *relative* price of labour would have fallen in smaller plants. In this situation, small plants may simply have responded to the changing relative factor prices that they faced and used more labour relative to capital. This, in turn, would have caused labour productivity to have fallen in the smaller plant sector.

Both explanations for the lagging productivity performance of small plants—technological change and a response to relative factor prices—are likely to have some validity. But whether small plants are depicted as technological laggards or simply responding to changing factor prices and moving to less capital-intensive technologies, their performance is not aptly described as an engine of growth. Nevertheless, it must be recognized that small firms have supplied jobs in the manufacturing sector. If wage flexibility had not existed in this sector, aggregated unemployment might have proven to be all that higher.

Notes

1. See Armington and Odle (1982), Birch and MacCracken (1983), Johnson and Storey (1985) and Davis, Haltiwanger and Schuh (1993).

2. See Picot, Baldwin and Dupuy (1995) for a similar study for other industrial sectors.

3. The unit that is chosen for the studies does not affect the results. In Baldwin and Picot (1995), establishments are chosen as the unit for the analysis. In Picot, Baldwin and Dupuy (1995), enterprises are the unit of analysis.

4. See Baldwin and Rafiquzzaman (1994) for a discussion of this taxonomy.

5. These are also the sectors where the most restructuring has been taking place (See Baldwin and Rafiquzzaman, 1994).

6. This is calculated as the sum of wages and salaries divided by the total number of production workers and salaried employees.

7. See Brown, Hamilton and Medoff (1990), Wannel (1991) and Morissette (1993) for evidence on wage rate differentials by size class in the United States and Canada, respectively.

8. Wage is defined once again as total salaries and wages divided by total salaried and production workers.

9. For the size class in each sector, the relative wages are calculated relative to the average wage for that sector.

10. In particular, head offices and establishments with less than 5 employees were excluded.

11. Following Davis, Haltiwanger and Schuh (1993), both previous- and current-period measures average employment in both periods for all plants—including both entrants and deaths. This implies that the maximum for the index ranges from -2 to + 2. The average size so calculated is used to place the plant in a particular size class.

12. The five-year periods range from 1970-75 to 1983-88.

13. No price index is available to place these shipments in real terms. Thus, calculations of relative share done in nominal terms may not be representative of changes in real shares if relative prices of output of small and large plants have been changing dramatically.

14. See Baldwin and Sabourin (1985) as well as Baldwin and Diverty (1985) for a discussion of the differences in advanced technology use in small and large manufacturing plants.

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